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The enablers in the relationship between entrepreneurial ecosystems and the circular economy: the case of Circularity.com

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Abstract

Purpose – This article investigates the evolutionary pathways adopted by a digital platform to favour the development of an entrepreneurial ecosystem inspired by circular economy behaviours, becoming an enabler in the development of a coevolutionary relationship between entrepreneurial ecosystems and circular economy.

Design/methodology/approach – An in-depth single case study method has been applied, investigating the case of circularity.com, the first and only circular economy industrial symbiosis platform in Italy.

Findings – The paper shows how digital platforms can transition toward circular business models, particularly for Small and Medium Enterprises (SMEs). Moreover, findings show how sustainable platforms' need to revise their business models to effectively engage with stakeholders. The analysis also shows the central role covered by entrepreneurial ecosystems in the transition toward a more circular and sustainable business models.

Originality – This paper contributes to theoretical development by offering new and insightful explanations of firms' behavior and coevolution, moving beyond the classic interpretation of industry dynamics, and analyzing a unique case study. This study has implications for both practice and research, as it offers a better and more holistic understanding of the enabling role of digital platforms for CE.

Keywords: Entrepreneurial ecosystems; circular economy; sustainable business models; coevolution; case study; Italy

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1 Introduction

In its 2050 strategic vision, the European Commission identifies the circular economy (CE) as a priority in achieving a sustainable world (European Commission, 2018). The need to move from a linear to a circular ecosystem is related to the increasing awareness of the negative externalities related to the impact caused by organizations on society. In this regard, academics and policymakers started to reflect on the concept of the Anthropocene, which represents a new era characterized by the unsustainability of human practices on the environment (Bebbington et al., 2019; Jennings and Hoffman, 2019). The paradigm shift has also been favored by the disruptive impacts caused by COVID-19 on the entrepreneurial ecosystem (Ellen MacArthur Foundation, 2020).

The benefits of the transition toward circular ecosystems have been widely analyzed by academics (Lahane et al., 2021; Prieto-Sandoval et al., 2018). In particular, these studies have shown that organizations inspired by a “closed-loop” approach can achieve positive rewards both in financial performance and contribution to sustainable development. Furthermore, CE represents a win-win solution for governments, citizens, and organizations due to the benefits related to its implementation (Lieder and Rashid, 2016; Singh and Giacosa, 2019). In this regard, CE represents a topic that impacts different stakeholder types due to its systemic approach.

Entrepreneurs represent one of the main categories interested in CE (Neumeyer et al., 2020). They represent central actors within the entrepreneurial ecosystems due to their relevance in terms of the number of actors involved and their contribution to sustainable development (Joon, 2018). However, CE has been overlooked by traditional

entrepreneurs, who have not yet recognized the great CE opportunities (Longo et al., 2019; López Ruiz et al., 2020; Sassanelli et al., 2019; Zhou et al., 2020), and also because they lack relevant knowledge in the field (Jin et al., 2017; Simon, 2013). This evidence is confirmed by the CE literature, which has shown that many academics have focused their studies on large companies and MNEs (Henry et al., 2020). Yet, small and medium enterprises (SMEs) represent 99% of the European business landscape and are responsible for approximately 64% of the industrial pollution, 40–45% of all industrial air emissions, water consumption, and energy consumption in the European Union (Ormazabal et al., 2018). Therefore, the strategic transition toward CE for SMEs is urgent and pivotal to support reaching the environmental targets and the UN Sustainable Development Goals (Pizzi et al., 2021).

Thus, comprehension of the main enablers that favor SMEs' adoption of business strategies inspired by CE represents one of the main challenges for academics, policymakers, and NGOs (Pizzi et al., 2020; Ünal et al., 2019)

Various efforts have to be directed toward changing entrepreneurship curricula and toward major support that entrepreneurs receive from their environment and institutions to fill this gap (Marzi and Caputo, 2019). In this direction, many authors (Neumeyer et al., 2020) posit that in order to build best practices of the sustainable and circular entrepreneurial ecosystem, several things have to happen. Firstly, linear entrepreneurial practices have to be aligned with the principles of the CE. Next, policies have to support sustainable entrepreneurship by distributing loans, grants, support programs, incubators, accelerator programs, platforms and so on. Among the different factors that enable SMEs to overcome barriers for CE implementation is digitalization, yet academic studies in this direction are still scarce. The present paper aims to fill this gap by contributing to the growing debate about how digitalization and digital ecosystems can provide the necessary

support to SMEs in overcoming their intrinsic barriers toward sustainable investments (Bartolacci et al., 2020; Pizzi et al., 2021).

Building upon previous studies on the role of enabling factors for ecosystems (Caputo et al., 2021; Dabic et al., 2016; Ferreira and Teixeira, 2019), this study investigates how an enabler firm could overcome SMEs' significant barriers to achieve CE. In particular, the analysis has been conducted by analyzing the organization Circularity, which is the leading Italian digital platform that operates in the CE field.

The contributions of this paper to existing scientific knowledge are several. Firstly, this study contributes to the literature on entrepreneurial ecosystems (Acs et al., 2018), furthering our understanding that digital platforms and enablers could be crucial in implementing SMEs' CE (Pizzi et al., 2021). Furthermore, Circularity's analysis extends the scientific debate about the main factors that impact the sustainability of platforms' business models (Lüdeke-Freund et al., 2019). Moreover, our findings also offer important practical implications, enabling policymakers to discover and adopt the factors that help SMEs overcome the actual barriers to implementing CE.

The article is structured as follows: in the second section, a literature review on CE and SMEs has been provided. The third section describes the theoretical framework used to evaluate our hypothesis, while section 4 consists of the methodology used. Section 5 presents the case study analyzed, section 6 the discussion. Finally, section 7 provides some reflections about our theoretical and managerial implications, while section 8 consists of our concluding remarks.

2 Literature review

2.1 *Circular Economy in SMEs*

The emerging need to shift from linear economic development to a sustainable circular one is undoubtedly an entrepreneurial opportunity to catch. Differently from other approaches, CE reduces the use of limited natural resources, providing macroeconomic benefits (Aranda-Usón et al., 2020; Geissdoerfer et al., 2017). Under a macroeconomic perspective, CE could reduce nations' dependence on foreign economies (Mulrow et al., 2017), produce financial benefits, and reduce environmental impacts (Geissdoerfer et al., 2017).

The characteristics of CE are the following: firstly, goods are thought to be reused, upgraded, and disassembled with minimal energy use, transforming waste in raw materials for other firms; secondly, the product lifecycle is maximized finding new uses at the end of its life; finally, new habits and consumer culture have to be promoted (Annarelli et al., 2016). In this regard, companies have to rethink their way to do business and create value to incorporate the elements previously described (Mura et al., 2020).

Even if the limitations of linear development based on "take, make, use, and waste" have to be replaced by the concept of a circular and sustainable economy, this transition could be possible only with adequate policies enabling and stimulating innovation and technological development (Pacheco et al., 2017). In this direction, policymakers launched a set of proposals to implement CE strategies by organizations (Camilleri, 2020; European Commission, 2020).

In this process, SMEs could have a fundamental role because they represent 99% of the number of European enterprises (Pizzi et al., 2020). Moreover, previous studies (Calogirou et al., 2010) show that SMEs cause approximately 64% of the industrial pollution in Europe and 40–45% of all air industrial air emissions, water consumption,

and energy consumption in the EU (Ormazabal et al., 2018). Thus, CE for SMEs is urgent because they are responsible for a large part of the world's emissions, waste, and resources consumption. Furthermore, SMEs that have implemented environmental practices have obtained material cost savings (Rizos et al., 2016) and other economic benefits (Hillary and Burr, 2011; Longo et al., 2005), as well as an increase of prestige and sustainability in the long term (Moore and Manring, 2009; Noci and Verganti, 1999; Del Río et al., 2016; Rizos et al., 2016).

Despite the positive externalities related to the adoption of sustainable business models by organizations, several studies underlined that CE implementation in SMEs is characterized by several barriers (Bartolacci et al., 2020; Jaeger and Upadhyay, 2020; Ormazabal et al., 2018). In particular, these studies confirm that SMEs have not considered CE a priority due to a lack of knowledge about the interlinkage between these practices and competitive advantage (Prieto-Sandoval et al., 2018). In this regard, the passage from theory to practice could be challenging for SMEs because they perceive barriers rather than opportunities and they are characterized by limited resources and short-term vision and lack of time in the daily activities (Graafland, 2016; Ormazabal et al., 2018).

The presence of enablers, incubators, technological tools, and platforms could help SMEs to overcome the major barriers, as well as practical policy instruments that support CE implementation in different countries (Camilleri, 2020; Esmaeilian et al., 2020; Pizzi et al., 2021).

A previous study (Mura et al., 2020) identified business opportunities to follow and develop in the transition towards CE in SMEs. In particular, introducing innovative management tools could be desirable in terms of non-financial indicators in the performance system, creating a value network and production ecosystem, and integrating

different company skills (Veleva et al., 2017). Furthermore, stimulating the culture for sustainability for macro, micro, and citizen levels is a fundamental step to spread education relating to sustainability and the importance of CE awareness (Fatimah et al., 2020). Finally, other studies reveal the great importance to communicate virtuous examples and case studies of companies and industrial ecosystems that have implemented circular business models, also the positive role of communication platforms that help the establishment of circular ecosystems (Bocken et al., 2018; Scarpellini et al., 2020). To the best of our knowledge, no studies have been conducted up to now about the potentiality and the effectiveness of the digital platforms in this process. This paper focuses on this, through a case study analysis.

2.2 *Barriers to and enablers of CE in SMEs*

Previous studies have investigated motivations, barriers, and enablers for CE implementation, especially in SMEs, in different countries, contexts and sectors (Afum et al., 2020; Ormazabal et al., 2018; Rizos et al., 2016).

Among the barriers to CE, not all play the same role. A first theoretical conceptualization distinguishes between *revealed barriers* and *detering barriers* (García-Quevedo et al., 2020). The authors highlighted that barriers could be classified according to firms' perceptions of their complexity. In this regard, revealed barriers consist of obstacles characterized by an adequate degree of complexity, while detering barriers represent obstacles perceived as unavoidable.

The classification proposed by Ormazabal et al. (2018) identifies two kinds of barriers: *hard barriers* and *human barriers*, which are considered in different ways. The first can be addressed by financial stimulation and technological modernization, while the second require a change of culture or specialists in the field.

Additionally, scholars have already found and analyzed the following barriers: lack of resources (human and financial) (Rizos et al., 2016) and capabilities (García-Quevedo et al., 2020), lack of support from public institutions (Preston, 2012), lack of coordination of regulations at EU, national, regional, and local level in the field of sustainability (Ormazabal et al., 2018), bureaucratic difficulty in applying the legislation on sustainability by companies, difficulty of orientation in the renewable energy market (Mura et al., 2020), inadequate information management system, lack of proper technology, lack of qualified professionals in environmental management (Ormazabal et al., 2016), lack of clear guidelines, failure of scientific knowledge to achieve social acceptance and awareness (Millette et al., 2020), existing organizational culture (Caldera et al., 2019), and perception of sustainability as a cost and not as an investment (Mura et al., 2020).

With particular reference to enablers, scholars have distinguished between traditional and innovative enablers. Hussain and Malik (2020) proposed an interpretative framework based on evaluating the different degrees of integration between sustainable practices and organizational changes. Thus, the authors reflected different approaches toward CE characterized by different degree of innovation.

The first wave of studies has paid specific attention to the opportunity to extend to CE the insights collected about the enabling factors that favor the implementation of sustainable practices. Despite the similarities between the two concepts, CE represents a standalone topic due to the need to consider the “economic” dimension related to adopting sustainable practices (Lüdeke-Freund et al., 2019; Pizzi et al., 2021). Regarding the dynamics related to CE, one of the primary research on the topic has been developed by Mura et al. (2020). Through an empirical analysis conducted on 254 organizations, the authors highlighted that education, co-opetition between actors, and institutional

pressures favored circular strategies' voluntary adoption. Furthermore, other studies have been conducted to collect insights about specific industries (Ghisellini et al., 2018; Jaeger and Upadhyay, 2020; van Keulen and Kirchherr, 2021).

Recently, academics started to discuss the contribution provided by technological innovation to CE. Several authors analyzed the dichotomy between digital transformation and CE (Kouhizadeh et al., 2019; Rosa et al., 2020). The concept of digital transformation has been widely analyzed during recent years due to the proliferation of new features that have affected business and society. In this regard, academics and practitioners have agreed about the central role of Industry 4.0 on these processes (Caputo et al., 2021; Ellen MacArthur Foundation, 2019).

Regarding the specific contribution of digital features on CE, the current debate is characterized by the coexistence of different insights collected about the specific tools analyzed. However, despite the specificities of the digital features observed, a large part of these studies highlighted the existence of a positive correlation between the implementation of circular practices and the reduction of asymmetric information between the actors involved within the processes (Bag et al., 2020; Kouhizadeh et al., 2019). In particular, these studies underlined the potentiality of emerging technologies such as blockchain, IoT and data analytics (Gupta et al., 2019; Lopes de Sousa Jabbour et al., 2018; Pizzi et al., 2021) (Nandi et al., 2020). Furthermore, other studies highlighted the potential implications related to the development of industrial symbiosis through the exchange of information between stakeholders through digital platforms (Berg and Wilts, 2019; Schwanholz and Leipold, 2020). This paper is part of this stream of literature, through its analysis of the case study of Circularity.

3 Theoretical framework

Previous reflections about CE have been driven by the complexity of the current scenario, characterized by external stimuli made by policymakers, NGOs, and citizens toward sustainable development (United Nations, 2015; World Economic Forum, 2020). One of the primary debates is related to implementing strategies inspired by the idea to involve the vast number of stakeholders within the entire value chain (Cardoso de Oliveira et al., 2019; Urbinati et al., 2017; Veleva and Bodkin, 2018).

Recent years have been interested in the rapid growth of digital platforms, which represent organizations that provide common standards, interfaces, and tools to leverage core technologies to increase companies' or users' productivity and profitability (Teece, 2017). In this regard, platforms represent enablers for overcoming different barriers that negatively affect implementing new practices by organizations, such as e-commerce, CRM, and internationalization (Nambisan and Baron, 2019; Trabucchi et al., 2019). Furthermore, an increasing number of studies have evaluated digital platforms' enabling role on sustainable practices, such as accountability, green procurement, and stakeholder engagement (Ciulli et al., 2020; Sodhro et al., 2019). In this regard, academics have agreed about the opportunity to consider the digital platform as a new organizational archetype (Sutherland and Jarrahi, 2018).

The development of a digital platform requires an in-depth analysis of the entrepreneurial ecosystems due to the high degree of interlinkages between the different stakeholders involved within the exchanges (Teece, 2017). In particular, several studies underline the complexities related to the introduction of a digital platform within entrepreneurial ecosystems characterized by the coexistence of stakeholders with different business models and attitudes toward sharing economy's principles (Cusumano et al., 2019; Helfat and Raubitschek, 2018). In this regard, the definition of the business model by a digital

platform requires the combination of the internal and external pressures experienced by stakeholders

However, the ex-ante definition of the business model represents a complex activity. In particular, barriers related to stakeholders' resistance can negatively affect the achievement of specific purposes within the ecosystems (Maher et al., 2018). Furthermore, other criticisms are related to the lack of knowledge about the positive externalities of platforms' involvement (Cenamor et al., 2019). In this regard, ex-post evaluations of digital platforms could reveal criticisms related to the complexities of entrepreneurial ecosystems.

According to this evidence, previous studies started to discuss the main components that characterize a digital platform. In particular, Gawer (2020) conceptualized the topic by identifying the main boundaries that typically compose digital platforms. Gawer (2020, p. 7) summarized the three boundaries in:

1. platform firm scope (what assets are owned, what labor is employed, and what activities are performed in-house);
2. platform sides' configuration and composition (which distinct groups of customers have access to the platform);
3. digital interfaces (these specify the degree of openness and the balance of directionality of the two-way exchange of data between the platform and each of its sides).

Furthermore, the author highlighted that digital platforms are characterized by evolutionary pathways related to the opportunity to revise their business models according to the ecosystem's external pressures. As evidenced by the analysis of the three boundaries, external actors are central within digital platforms' strategies. Thus, digital

platforms continuously revise their business models over time to integrate new features and services useful to engage more effectively with users.

This research aims to evaluate the evolutionary pathways adopted by a digital platform to favour the development of an entrepreneurial ecosystem inspired by sustainable behaviours. Following the theoretical framework proposed by Gawer (2020), the research will extend the scientific debate about the enabling role occupied by a digital platform on the voluntary adoption of sustainable practices by SMEs. The analysis will extend the scientific debate through the evaluation of the following research propositions:

RP₁: What are the main limits toward the digital and sustainable transition of SMEs?

RP₂: What are the main drivers that contribute to developing a platform that integrates within its business model sustainable and digital features?

4. Methods

4.1 Research protocol

The analysis has been conducted through a single case study (Hinkin et al., 1997), representing a research method widely adopted by management scholars to analyze topics characterized by the high complexity of the phenomenon and infancy in the development of scientific knowledge (e.g., Caputo et al., 2019). In particular, the analysis has been conducted by developing a research protocol based on the analysis of internal and external sources to avoid the risks related to the implementation of research characterized by lack of objectivity (Hinkin et al., 1997). In this regard, as evidenced in Table 1, the paper combines the insights collected through direct interviews with the manager and staff members with archival data released by independent sources such as blogs, media and practitioners (Masiero et al., 2019; Silvestri et al., 2017).

Please Insert Table 1

4.2 The case

Circularity is the first Italian platform that has been developed to foster the industrial symbiosis of different types of organizations. The platform operates in an entrepreneurial ecosystem composed of more than 20,000 organizations identified according to their geolocalization and their sector of activity. The unicity of the case is confirmed by its organizational structure. In detail, the platform operates through a business strategy that combine technological and sustainable paradigms, as evidenced by the inclusion within the official registers of innovative startups and by the achievement of the license to operate as a benefit corporation.

Circularity adopted the "holistic" concept of a platform that combines innovatively different databases. In particular, the platform allows the evaluation of the potential interlinkages between organizations and other features such as information support services, training, consulting, redesign, and certification. Some of these features can be found in competitors' offers but are not integrated into a systemic mode and are proposed individually.

As a startup, Circularity stands out for two unique and peculiar aspects:

1. the logical, physical, and virtual (informative and usable) integration of all services into a single online platform;
2. the immediate visibility achieved thanks to the consolidated network of shareholders, considered among the leading players in the environmental services sector, eager and determined to undertake the transition to CE, which offer, in addition to the necessary economic support in the development phase, the real possibility of using, adopting, and demonstrating the usefulness of the services offered for the effective transition to circular practices.

Even the first-level partnerships that collaborate on the platform have been activated thanks to the founders' knowledge and will bring a real added value in the range of services offered. In particular, the main actors involved within the platform are represented by:

- waste producers (companies);
- waste treatment plants;
- raw material producers;
- waste conveyors;
- second raw material users (startup/circular production companies);
- consultants;
- local communities and NGOs.

5. Results

According to the theoretical framework proposed by Gawer (2020), the following section consists of the analysis of the life cycle of Circularity, with particular attention to the specific boundaries identified by the founders and the evolution of the business model over time.

5.1 The journey of Circularity

Circularity was born as an innovative startup and benefit corporation to create value for shareholders and stakeholders.

The idea starts with the awareness that the economy's linear model must be replaced with the circular one. To do so, companies need to have tools, easily usable, aimed at accompanying them in a path of "circularization" of their business model, starting from

the knowledge of the economic and environmental added value of their materials at the end of life.

The ten-year skills of the senior part of the team in the world of the green economy, integrated with those of the young component aimed at innovation and digital, made it possible to decide to create a model based on an online service platform to support services, with the support of an offline consulting service. The purpose of the digital tools available to the user is to accompany them in growth and awareness of CE's opportunities. In particular, the tool favors the development of specific knowledge about the opportunity to rethink their processes to increase organizations' competitive advantage.

5.2 The scope of Circularity

The scope of the platform can be summarized as follows:

- to accompany companies on a path of interweaving sustainability in their business strategy, addressing the transition to CE;
- to promote the reuse of by-products from industrial production waste, encouraging companies to put them permanently within their own or other production models, thanks to the "Green Procurement" and "Green Producer" sustainability certificates prepared by RINA Italy;
- to help companies to reconceive their production model, reducing waste, supported by qualified partners and by economic stimuli (such as the tax credit granted for considerable research and innovation projects);
- in enhancing non-recoverable waste, to support companies and help them choose between the best systems and their conveyors, based on the proximity to the production site, the best economic condition, and the standard "Green Touch" sustainability certificate set out by RINA.

5.3 Circularity's platform sides' configuration and composition

Circularity's focus is on the issue of the flow of material and its recovery in end-of-life products. In this regard, identifying the main actors involved within its platform represents a complex activity due to the relevance of the theme.

The platform was created to develop a virtual place that allows users to belong to different supply chains or different parts of the value chain of materials at the end of life and take on a new one. Furthermore, the founders identified in Circularity a digital tool useful for comparing, sharing, and analyzing information, and designing and then offering mutual support to exchange experiences, solutions, and material.

In particular, Circularity was introduced within the ecosystem to fill the information gaps related to the lack of transparency regarding material flows. The Italian context is characterized by the absence of a national database of operators that deal with materials at the end of life. Given the local responsibility for permits, all other entities – such as treatment and recovery facilities and containment or destruction facilities – are identified on more or less up-to-date regional databases. A unitary view of the subjects logically connected by interactions involving end-of-life materials is necessary to understand the potential of new relationships between subjects in the circular transition.

Regarding the second information gap, there is also no "classification" of companies operating in end-of-life materials, based on objective information about the suppliers' practices. Therefore, an organization that produces waste, which wants to choose a partner for collecting and processing its waste that is mainly oriented to sustainable practices or is particularly virtuous in terms of material recovery, is unable to do so. Furthermore, the founder stated:

"Those who opt to recycle their waste materials are not able to assess the percentage of recyclability or the type of process used by the supplier.

Furthermore, there is no transparency about the environmental impact of transport and disposal activities. Our experience with numerous companies, even of excellent national standing, demonstrates a general attitude not to consider the degree of recyclability guaranteed by a specific supplier."

Circularity aims to fill these gaps through a database, providing information where a company can, autonomously, look for the most suitable environmental operators to treat their waste, using not only economic and compliance parameters but also using information on the environmental impact of its choice. The same company can also identify individuals who are able to encourage the supply of recycled material to be introduced within its production cycle. It is possible to find a "circular path" or "close the circle" with end-users to minimize the waste of raw materials on the same platform. Related to the macro-categories of business models declined in the CE concepts, the supply of this information and processes aims to meet the objectives of "resource recovery" and support the implementation of "circular supply".

5.4 Circularity's digital interfaces

Circularity's digital interface consists of a cloud-based platform that allows users to use filters to identify potential collaborations. The interface allows users to identify their suppliers or clients by identifying the sector of origin, the geographical area, and the type of waste. Furthermore, to favor the development of an entrepreneur ecosystem inspired by the CE's paradigm, users are classified as producers, users, carrier services, and waste disposal plants (Figure 1).

Please Insert Figure 1

Regarding the specificities of Circularity, one of the platform's main tools consists of classifying users by identifying their wastes' life cycle. Thus, firms can develop new relationships with actors that operate within the same value chain by analyzing their waste types. On this point, the management of Circularity stated:

"We adopt an approach based on the 'family tree' concept. In our vision, the development of an ecosystem inspired by circular economy principles requires a high degree of transparency. In this regard, we are interested not only in the existence of recycling mechanisms but also in the 'quality' of these processes."

Finally, the top management of Circularity started to rethink their business model to consider the potential to increase the traceability of the processes by using blockchain. In particular, they justified their choice by the need for more transparency within the entire value chain:

"Every exchange generates positive and negative externalities. If we want to evaluate the 'circularity' of a product more effectively, we need to analyze its entire history. In our perspective, the concept of recycling is different from the concept of reusing. Thus, blockchain will enable the development of more sophisticated analysis of organizations' impacts."

5.5 The evolutionary pathways of Circularity

The founders of Circularity conceptualized a subscription-based platform to favor the interactions between different actors involved within the ecosystem. The founders underlined the difficulties related to the implementation of a sustainable platform due to the lack of knowledge about CE. In this regard, Circularity evolved over the years to integrate within its business model the pressures made by the entrepreneurial ecosystem. To support the promotion and knowledge of CE themes, ancillary services, or user support services such as training, information, and consulting services, have been

associated with this core part. At the current stage, users can take advantage of several tools and services, made available by Circularity to extend their business model.

In particular, the platform offers information services, green assessment, training, certification, and consulting services. Thus, Circularity has revised its business model to integrate the external pressures on stakeholders. In contrast to the years immediately after its official launch, the platform has now evolved from a subscription-based business model to a consulting-based business model (Figure 2).

Please Insert Figure 2

6. Discussions

The ecological transition of SMEs represents a central topic within the debate on sustainable development. Despite the development of new policies by regulators, the implementation of sustainable practices represents an activity characterized by several barriers related to cultural and technological factors. In particular, this criticism applies to SMEs, which represent the main actors within the international markets.

Digital platforms occupy a central role within the debate. As evidenced in prior studies about SMEs, digital platforms can enable the implementation of new practices by SMEs through their ability to develop synergies between actors involved within the network (Jean et al., 2020; Yonatany, 2017). This evidence is particularly relevant in CE due to the lack of knowledge about the opportunities related to the transition from linear to circular business models (Dentchev et al., 2018). Prior studies underlined that SMEs perceived the costs related to the transition to sustainable business models higher than the revenues (Mura et al., 2020; Ormazabal et al., 2018).

However, comprehension of digital platforms' real contribution toward the sustainable and circular transition of the planet requires a cautionary approach. One of the main criticisms is represented by the need to consider entrepreneurial ecosystems within the analysis (Teece, 2017). Comprehension of a digital platform's business model requires analyzing the external environment to understand the main strengths and weaknesses related to the services provided (Helfat and Raubitschek, 2018). In this regard, the evaluation of digital platforms' contributions requires considering different boundaries, such as scope, users, and technological devices (Gawer, 2020).

The lessons learned from the analysis of Circularity are several. The analysis reveals that sustainable platforms need to revise their business models to engage more effectively with stakeholders. Despite the existence of positive externalities related to adopting a digital platform to generate synergies with partners, Circularity's experience has shown that the exchange of information between organizations requires a facilitator to mitigate some of the technical and cultural barriers that have characterized the first wave of experiences in CE. In this regard, the revision of the business model made by Circularity reveals that the passage from a subscription-based approach toward a consultancy-based approach has been relevant for developing the platform. However, the road ahead to a more sustainable paradigm requires further investment by Circularity. In this regard, the next few years will be characterized by implementing new digital tools to increase the transparency of the platform's services.

Finally, the analysis reveals the central role occupied by entrepreneurial ecosystems. In particular, our findings showed that the transition toward a more circular and sustainable ecosystem could not be achieved without comprehension of the main drivers that affect the adoption of circular practices by SMEs. In this regard, academics and policymakers

could occupy an enabling role within the debate due to the need to support SMEs' implementation of best practices.

7. Theoretical and practical implications

The theoretical implications of the paper are several. First, the study extends the scientific knowledge of SMEs and CE through the new perspective of the enabling role of digital platforms. In particular, the case study showed the potential contributions provided by digital platform within entrepreneurial ecosystems characterized by SMEs' predominance. In addition, the case study contributes to the advancement of scientific knowledge of platform organizations, which represents a novel and unexplored field of research (Sutherland and Jarrahi, 2018). In particular, the case analysis has highlighted the need to operate through flexible business models to integrate the external pressures experienced by stakeholders, which represents the main factor that impacts digital platforms' success (Gawer, 2020).

The managerial implications of our study are represented by the opportunity for SMEs to revise their business models through digital platforms. In particular, our case study showed that digital platforms could support SMEs' ecological transition through their services. In this regard, financial and technical barriers related to adopting sustainable business models can be avoided by exchanging information between the various stakeholders involved within the platforms. Also, the development of new knowledge and expertise indirectly could favor the achievement of new competitive advantage by organizations due to the increasing attention paid by stakeholders to sustainable development.

As regards political implications, the analysis underlines the benefits related to the development of entrepreneurial ecosystems based on sustainable paradigms. The analysis

confirms the central role of traceability, which represents both a tool to evaluate the externalities caused by organizations within society and both a way to favour the exchange of knowledge and expertise between the networks. In this regard, as evidenced by the European Commission, digital features could allow enablers to achieve more sustainable financial markets (Hedberg and Šipka, 2020).

8. Conclusions

The last few years have seen the wide diffusion of sustainable practices by large organizations (KPMG, 2020). This paradigm shift was favored by the external pressures experienced by internal and external stakeholders about the impacts generated by organizations within society. Furthermore, a central role was occupied by policymakers who introduced within their jurisdictions new forms of regulation to support the development of best practices on a voluntary or mandatory basis (Camilleri, 2020).

Despite the positive trends, the achievement of a more sustainable ecosystem is negatively affected by the lack of participation of SMEs, which represent more than 99% of European organizations (Pizzi et al., 2021). In particular, several studies have shown the existence of barriers related to the lack of sustainable culture and the high costs of implementing these practices (Mura et al., 2020; Ormazabal et al., 2018). Thus, the voluntary transition toward a more sustainable business model by SMEs suffers from several criticisms.

Within this scenario, a pivotal role could be occupied by digital platforms, which represents innovative organizations characterized by a high degree of flexibility. The case of Circularity has shown that a startup could favor adopting paradigms inspired by CE's

principles through the exchange of information between organizations. In this regard, some of the main barriers that negatively affect adopting these practices can be avoided by adopting a digital platform.

However, the case study reveals criticisms related to the implementation of digital platforms to promote the adoption of circular strategies by SMEs. In particular, the analysis underlined the central role occupied by the platforms' attitude to revise their business model according to the pressures experienced by entrepreneurship. In this regard, it is necessary to develop a digital platform characterized by a high degree of flexibility.

According to this evidence, the implications of our study are several. The analysis of Circularity will represent a step forward in advancing scientific knowledge and developing new knowledge of the managerial implications related to implementing a digital platform. The high degree of contamination between the scientific and managerial dimensions suggests the needs for further studies about the enabling role occupied by digitalization on sustainable behaviors.

Our research presents some limitations. In particular, a case study's development does not consider other cases characterized by a different CE approach. In this regard, future research could be addressed to fill this gap by implementing empirical or qualitative studies based on a more extensive sample analysis.

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Table 1 Main sources analysed within the research

Data collection				
<i>Interviews</i>	<i>Position</i>	<i>Interviewee</i>	<i>Perspective</i>	<i>Duration</i>
	Founder	Manager A	Internal	120 minutes/2 meetings
	Director	Manager B	Internal	60 minutes/1 meetings
	External consultant	Manager C	External	60 minutes/1 meeting
<i>Archival data</i>	<i>Document</i>	<i>Perspective</i>		
	13 Articles about Circularity.com published in Italian Journals	External		
	2 Internal Reports published by Circularity	Internal		

Figure 1

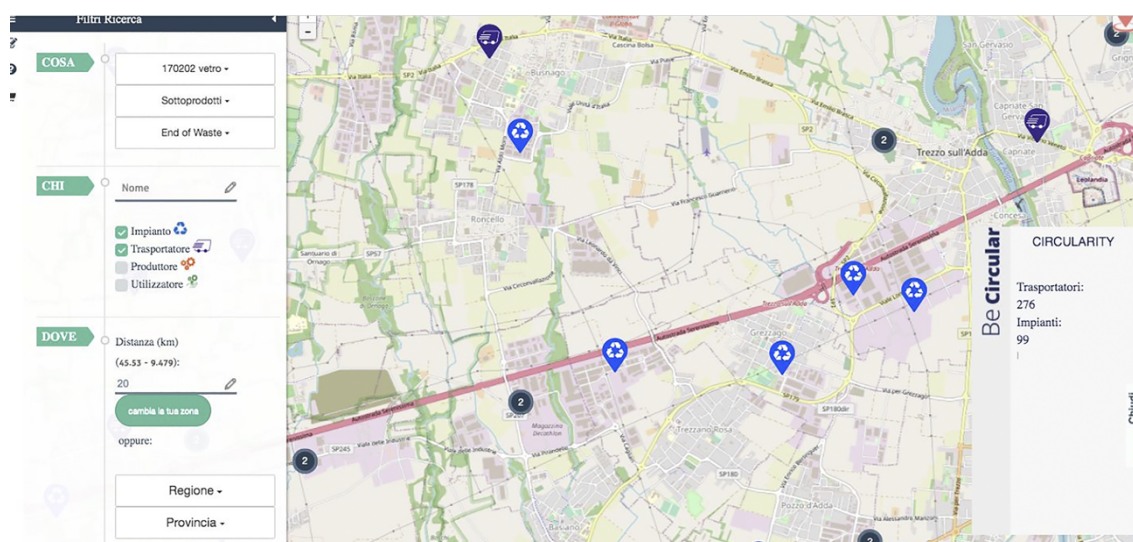


Figure 2

